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Approval

DATE : Sep. 19, 2011.

SAMSUNG TFT-LCD

MODEL NO. : LTN140KT09-8

NOTE : Extension code [-8**]
→ LTN140KT09-8**
Surface type [**Anti-Glare**]

The information described in this SPEC is preliminary and can be changed without prior notice.

APPROVED BY :

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Application Engineer Group

SAMSUNG ELECTRONICS CO., LTD.

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SPEC REVISION HISTORY

Date	Revision No.	Page	Summary
July. 04, 2011	P00	All	The preliminary specification of LTN140KT09-8 was issued first.
Aug. 19, 2011	A00	All	The approval specification was issued first.

CODE REVISION HISTORY

Date	Model.	Revision No.	Summary	MP or EOL
July. 04, 2011	LTN140KT09	801	Basic model	From August. 2011 ~

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GENERAL DESCRIPTION

DESCRIPTION

LTN140KT09 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight unit. The resolution of a 14.0" contains 1600X900pixels and can display up to 16.2M colors. 6 O'clock direction is the optimum viewing angle.

FEATURES

- High contrast ratio
- HD+ (1600 x 900 pixels) resolution
- Fast Response
- LED Back Light with embedded LED Driver
- DE (Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- Green product (RoHS compliant)
- APS function
- 6bit-FRC

APPLICATIONS

- Notebook PC
- If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	309.6H) x 174.15(V) (14.0” diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	16.2M		
Number of pixel	1600 x 900	pixel	
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.1935(H) x 0.1935(V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 25%, Hard-Coating 3H		Anti-glare

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Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	323	323.5	324	mm	
	Vertical (V)	191.4	191.9	192.4	mm	Module ~ Module
		204.4	204.9	205.4	mm	Outsize with Frange
	Depth (D)	-	-	4.0	mm	(1) Body area
Weight		-	-	355	g	

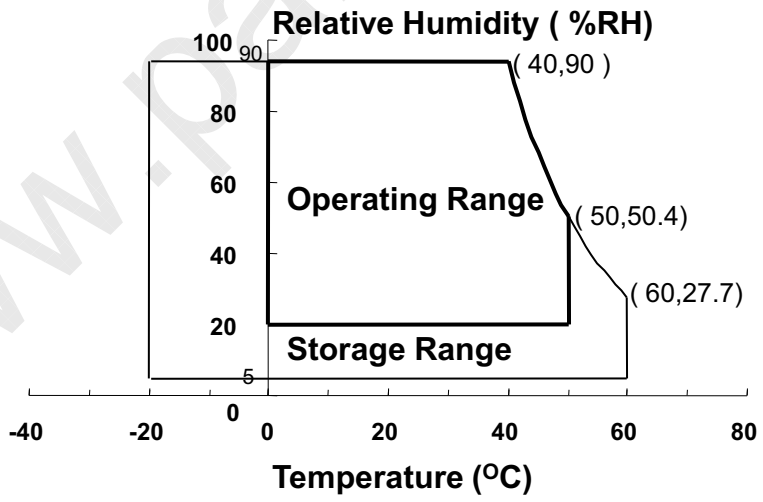
Note (1) Measurement condition of outline dimension
. Equipment : Bernier Calipers
. Push Force : 750 ± 250 g ·f

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperate (Temperature of glass surface)	TOPR	0	50	°C	(1)
Shock (non-operating)	Snop	-	240	G	(2),(4)
Vibration (non-operating)	Vnop	-	2.41	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 °C ≥ Ta)
Maximum wet - bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation



(2) 2ms, half sine wave, one time for ±X, ±Y, ± Z.
(3) 5 - 500 Hz, random vibration, 30min for X, Y, Z.
(4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

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1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

V_{DD} =3.3V, V_{SS} = GND = 0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	V_{DD} - 0.3	V_{DD} + 0.3	V	(1)
Logic Input Voltage	V_{IN}	V_{DD} - 0.3	V_{DD} + 0.3	V	(1)

Note (1) Within Ta (25 ± 2 °C)

(2) BACK-LIGHT UNIT

Ta = 25 ± 2 °C , Duty = 100%

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Current	I_L	-	25	-	mA	(1)
LED Voltage	F_L	3.0	3.2	3.4	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded
Functional operation should be restricted to the conditions described under normal operating conditions.

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2. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5).
Measuring equipment : TOPCON SR-3

* Ta = 25 ± 2 °C, V_{DD}=3.3V, fv= 60Hz, f_{DCLK} = 50.2MHz, IF = 25mA

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR	Normal Viewing Angle $\phi = 0$ $\theta = 0$	300	-	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		T_{RT}		-	16	25	msec	(1), (3)
Average Luminance of White (5 Points)		$Y_{L,AVE}$		255	300	-	cd/m^2	IF=25mA (1), (4)
Color Chromaticity (CIE)	Red	R_X		TYP -0.03	0.575	TYP +0.03	-	(1), (5) SR-3
		R_Y			0.345			
	Green	G_X			0.330			
		G_Y			0.558			
	Blue	B_X			0.160			
		B_Y			0.120			
	White	W_X			0.313			
		W_Y			0.329			
Viewing Angle	Hor.	θ_L	CR ≥ 10 At center	40	45	-	Degrees	(1), (5) SR-3
		θ_R		40	45	-		
	Ver.	ϕ_H		10	15	-		
		ϕ_L		25	30	-		
13 Points White Variation		δ_L		-	-	2.0	-	(6)
Color Gamut		CG		-	45	-	%	

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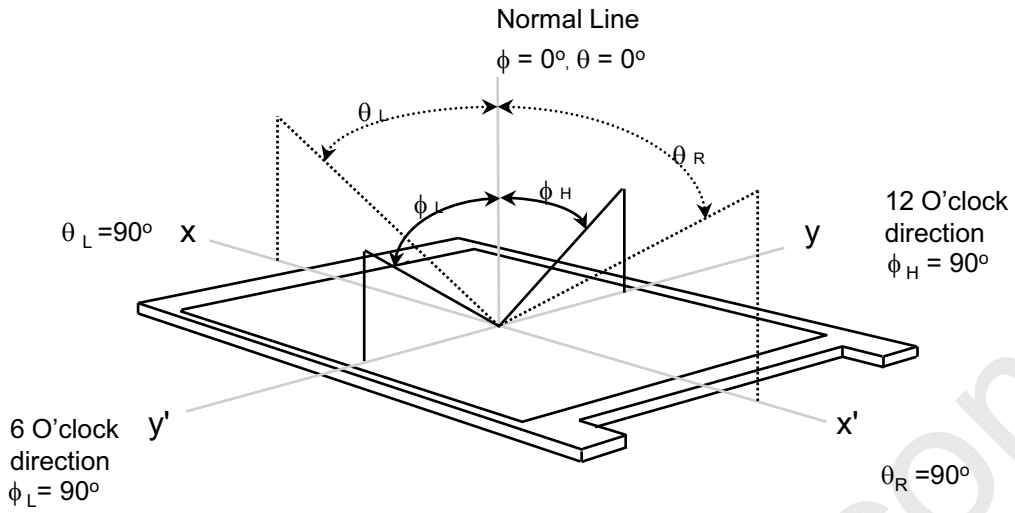
Note 1) Definition of Viewing Angle : Viewing angle range(10 ≤ C/R)

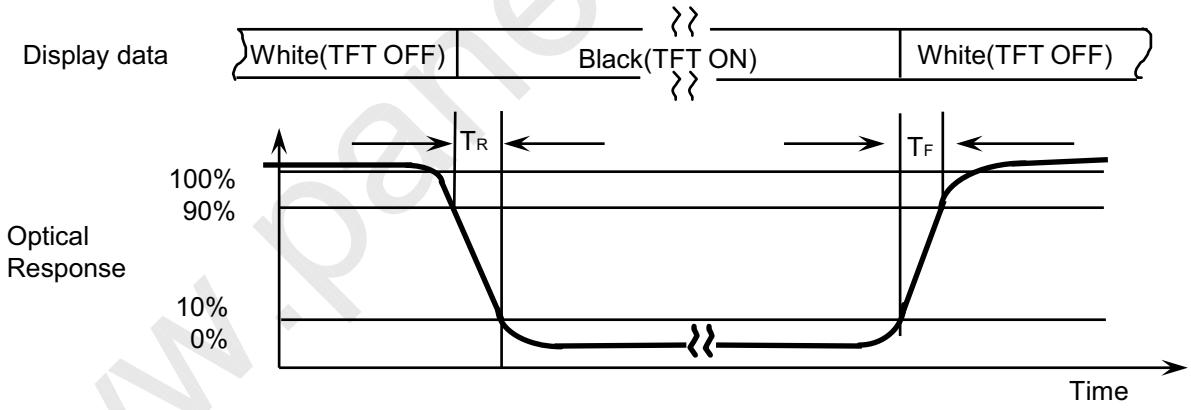


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

Points : ④ , ⑤ , ⑦ , ⑨ , ⑩ at the figure of Note (6).

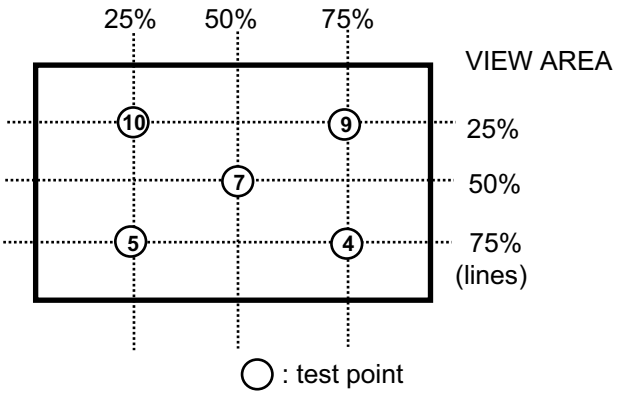
Note 3) Definition of Response time :



Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

Average Luminance of White ($Y_{L,AVE}$)

$$Y_{L,AVE} = \frac{Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}}{5}$$



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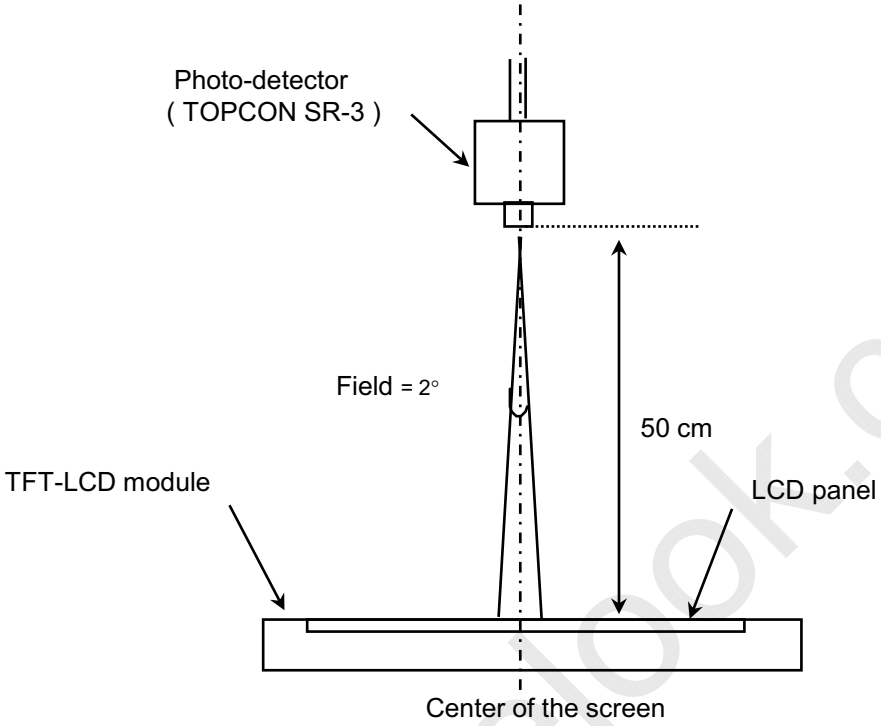
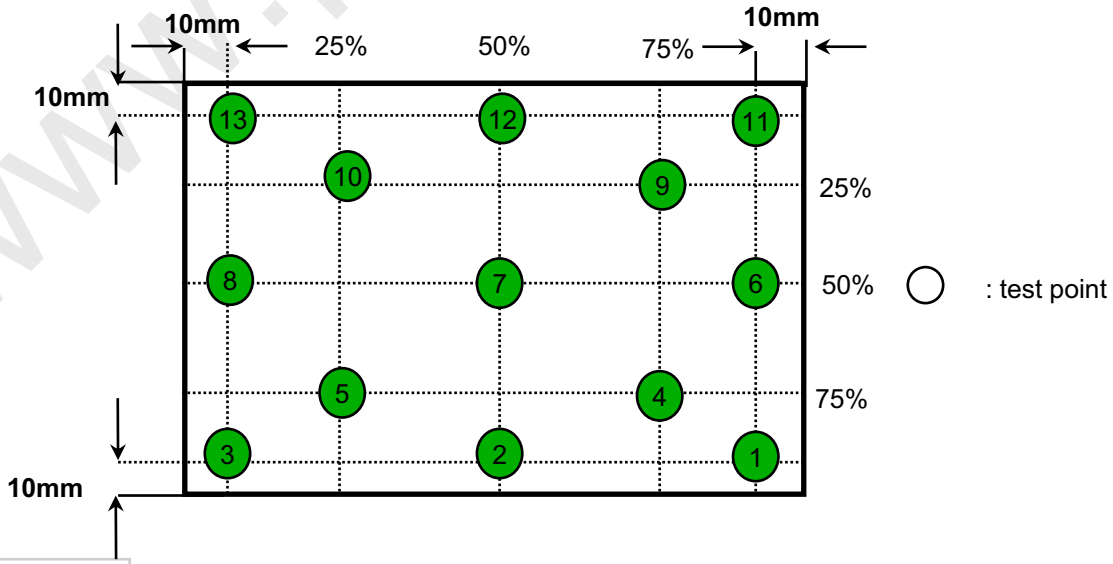
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room.
30 min after lighting the backlight. This should be measured in the center of screen.
IF current : 25 mA
Environment condition : Ta = 25 ± 2 °C



[Optical characteristics measurement setup]

Note 6) Definition of 13 points white variation (δ_L), CR variation(C_{VER}) [① ~ ⑬]

$$\delta_L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$



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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM} = +1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Main Frequency		f_{DCLK}	-	50.2	-	MHz	2CH
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	IDD	-	330	-	mA	(2),(3)*a
	Mosaic		-	330	-	mA	
	Black		-	330	-	mA	(2),(3)*b
	V.Stripe		-	540	-	mA	(2),(3)*c

Note (1) Display data pins and timing signal pins should be connected.(GND = 0V)

(2) f_V = 60Hz, f_{DCLK} = 50.2MHZ, V_{DD} = 3.3V , DC Current.

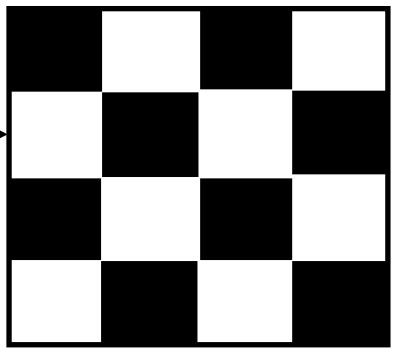
(3) Power dissipation pattern

*a) White Pattern

Display Brightest Gray Level

Display Darkest Gray Level

*b) Mosaic Pattern



*c) Black

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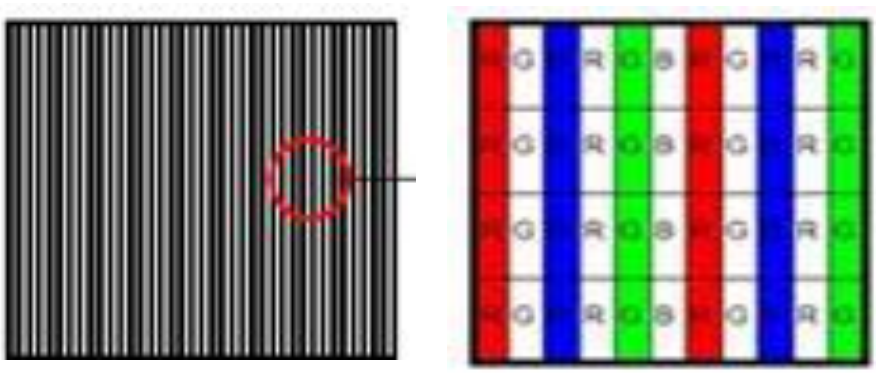
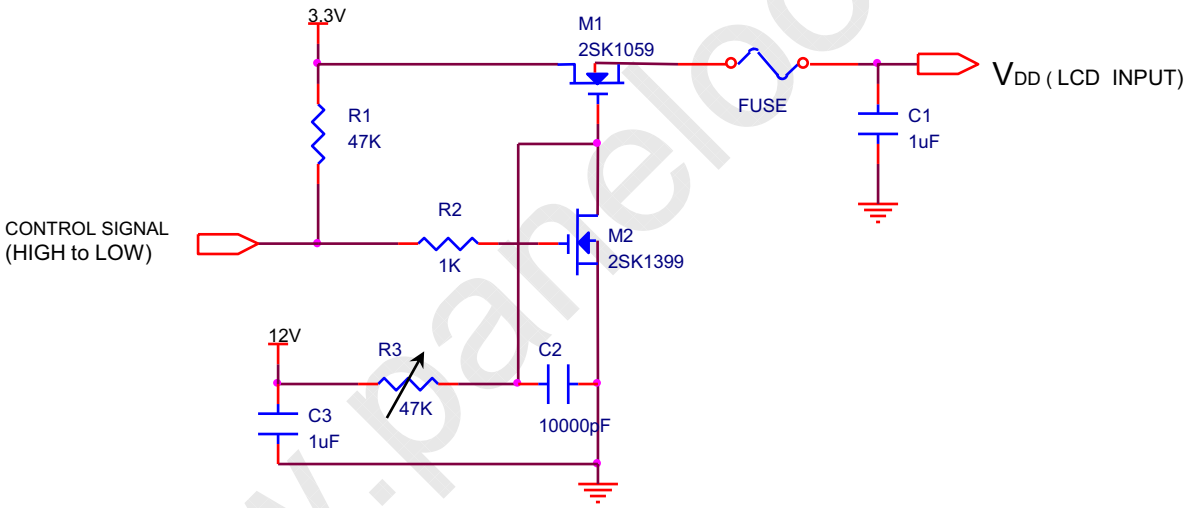
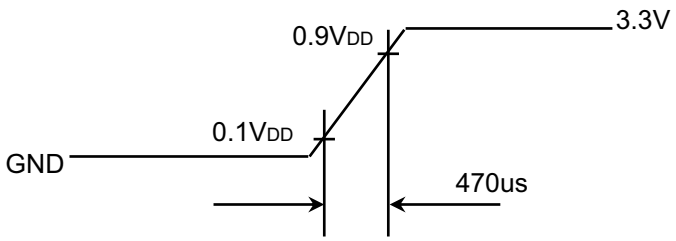
d) V.Stripe



4) Rush current measurement condition



VDD rising time is 470us



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3.2 BACK-LIGHT UNIT

Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	25	-	mA	
LED Forward Voltage	VF	3.0	3.2	3.4	V	
LED Array Voltage	VP	27	28.8	30.6	V	VF X 9 LEDs
LED Counts		-	36	-	EA	
Operating Life Time	Hr	10,000	-	-	Hour	(1)

Note (1) Life time (Hr) of LEDs can be defined as the time in which it continues to operate under the condition Ta= 25 ± 2 °C and IF = 25mA until one of the following event occurs.
1. When the brightness becomes 50% or lower than the original.

3.3 LED Driver

- On board LED Driver (Manufacturer : Richtek)

Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	6	12	24	V	
Input Current	I	-	310	-	mA	
BL power consumption	Pin	-	-	0.85	W	@ 60nit
		-	-	3.55	W	@ Max
EN Control Level	ON	1.5	3.3	5.0	V	
	OFF	0	0	0.5	V	
PWM Control Level	ON	1.5	3.3	5.0	V	
	OFF	0	0	0.1	V	
External PWM Dimming Control Frequency (BLIM)	F_{BLIM}	0.20	-	10	kHz	Vin=7~20V, BLIM=PWM 0V~3.3V
PWM duty ratio	D	5	-	100	%	PWM Freq. : 200Hz~10KHz
		10	-	100	%	PWM Freq. : 1KHz~10KHz

Note - Test Equipment : Fluke 45

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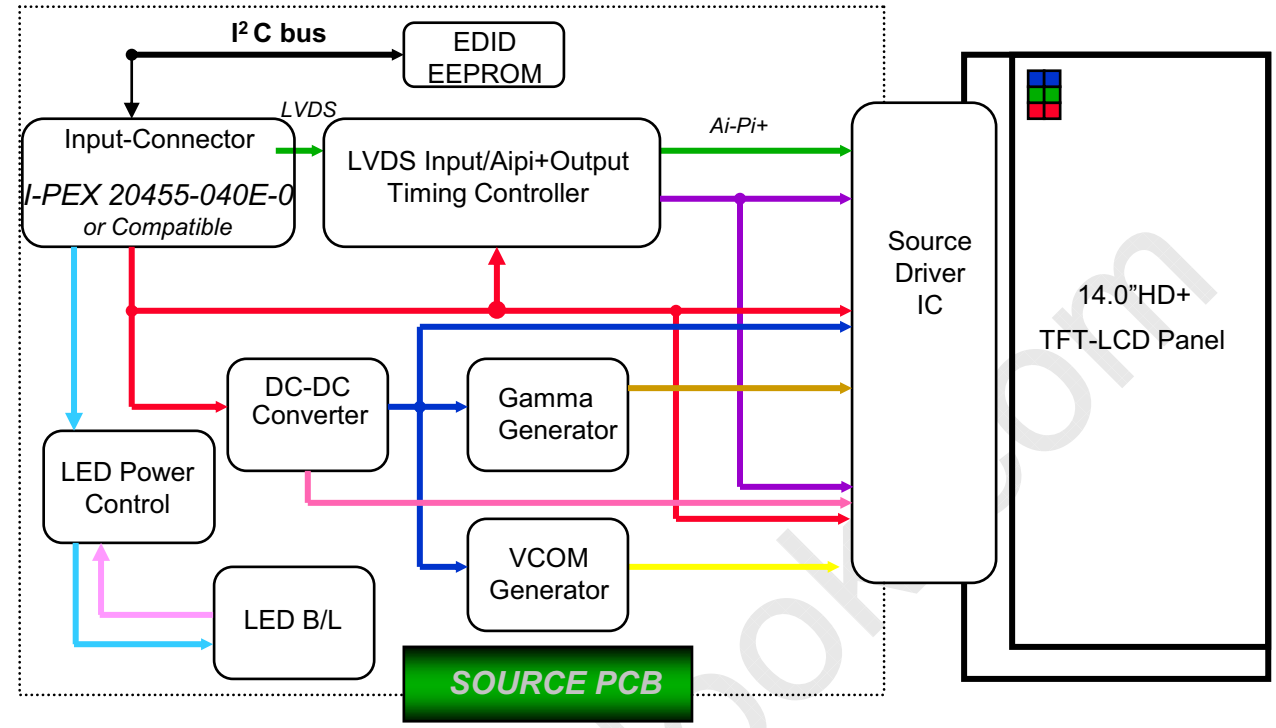
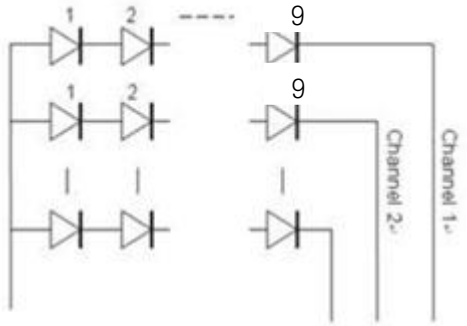
4. BLOCK DIAGRAM

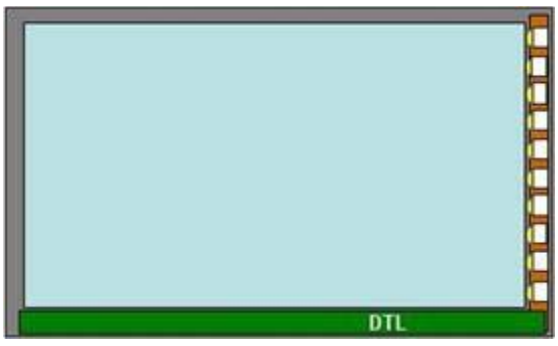
4.1 TFT LCD Module



4.2 LED connection and placement



LED Wiring



LED Placement

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5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector IPEX 20455 's or Compatible)

No.	Symbol	Function	Polarity	Remarks
1	VCC	Power Supply 3.3V (typical)		
2	VCC	Power Supply 3.3V (typical)		
3	VCC_EDID	VCC_EDID		
4	WPN	No Connection		
5	CLK	CLK_EDID		
6	DATA	DATA_EDID		
7	Odd RIN0-	- LVDS differential data input (G0, R0-R5)	Negative	
8	Odd RIN0+	+ LVDS differential data input (G0, R0-R5)	Positive	
9	Odd RIN1-	- LVDS differential data input (B0-B1, G1-G5)	Negative	
10	Odd RIN1+	+ LVDS differential data input (B0-B1, G1-G5)	Positive	
11	GND	Ground		
12	Odd RIN2-	- LVDS differential data input (B2-B5, DE, VS, HS)	Negative	
13	Odd RIN2+	+ LVDS differential data input (B2-B5, DE, VS, HS)	Positive	
14	GND	Ground		
15	Odd CLK-	- LVDS differential clock input (Odd Clock)	Negative	
16	Odd CLK+	+ LVDS differential clock input (Odd Clock)	Positive	
17	GND	Ground		
18	Odd RIN3-	- LVDS differential data input (R6-R7, G6-G7, B6-B7)	Negative	
19	Odd RIN3+	+ LVDS differential data input (R6-R7, G6-G7, B6-B7)	Positive	
20	GND	Ground		
21	Even RIN0-	- LVDS differential data input (G0, R0-R5)	Negative	
22	Even RIN0+	+ LVDS differential data input (G0, R0-R5)	Positive	
23	Even RIN1-	- LVDS differential data input (B0-B1, G1-G5)	Negative	
24	Even RIN1+	+ LVDS differential data input (B0-B1, G1-G5)	Positive	
25	GND	Ground		
26	Even RIN2-	- LVDS differential data input (B2-B5, DE, VS, HS)	Negative	
27	Even RIN2+	+ LVDS differential data input (B2-B5, DE, VS, HS)	Positive	
28	GND	Ground		
29	Even CLK-	- LVDS differential clock input (Even Clock)	Negative	
30	Even CLK+	+ LVDS differential clock input (Even Clock)	Positive	

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No.	Symbol	Function	Polarity	Remarks
31	GND	Ground		
32	Even RIN3-	- LVDS differential data input (R6-R7, G6-G7, B6-B7)	Negative	
33	Even RIN3+	+ LVDS differential data input (R6-R7, G6-G7, B6-B7)	Positive	
34	DE_EN	DE_EN		
35	BL_EN	BL_EN		
36	PWM	PWM		
37	GND	Ground		
38	VBL	VBL		
39	VBL	VBL		
40	VBL	VBL		

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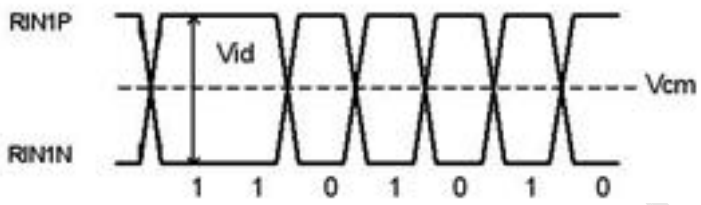
5. 2 LVDS Interface

5.2.1 LVDS DC Input

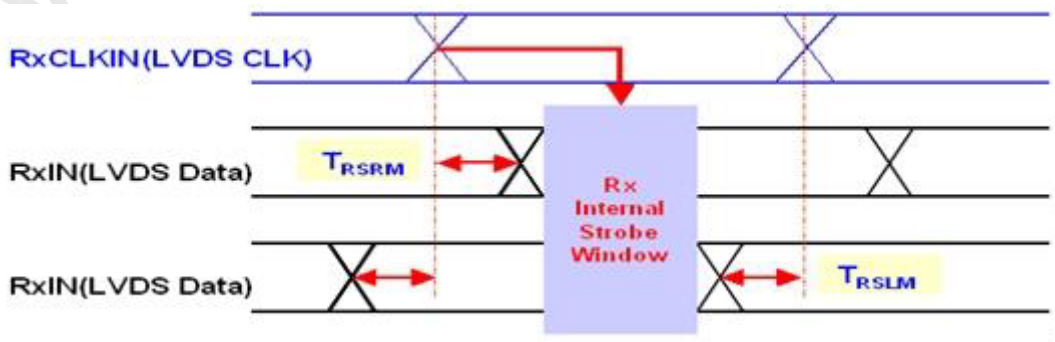
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LVDS Differential Voltage	Vid	200	200	400	mV	
Input Common Mode Voltage	V_{CM}	0.4	1.2	1.6	V	



5.2.2 LVDS AC Input

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LVDS input clock frequency		F_{CLK_LVDS}	20	-	100	MHz	
RIN skew margin	100 MHz	T_{RSRM}	-200	-	200	ps	(1),(2)
	50 MHz		-600	-	600	ps	(1),(2)
SSC Modulation Rate			-	-	±3	%	(3)
SSC Modulation Frequency			-	-	300	KHz	(3)

Note (1) : LVDS Receiver Skew (Strobe) Margin



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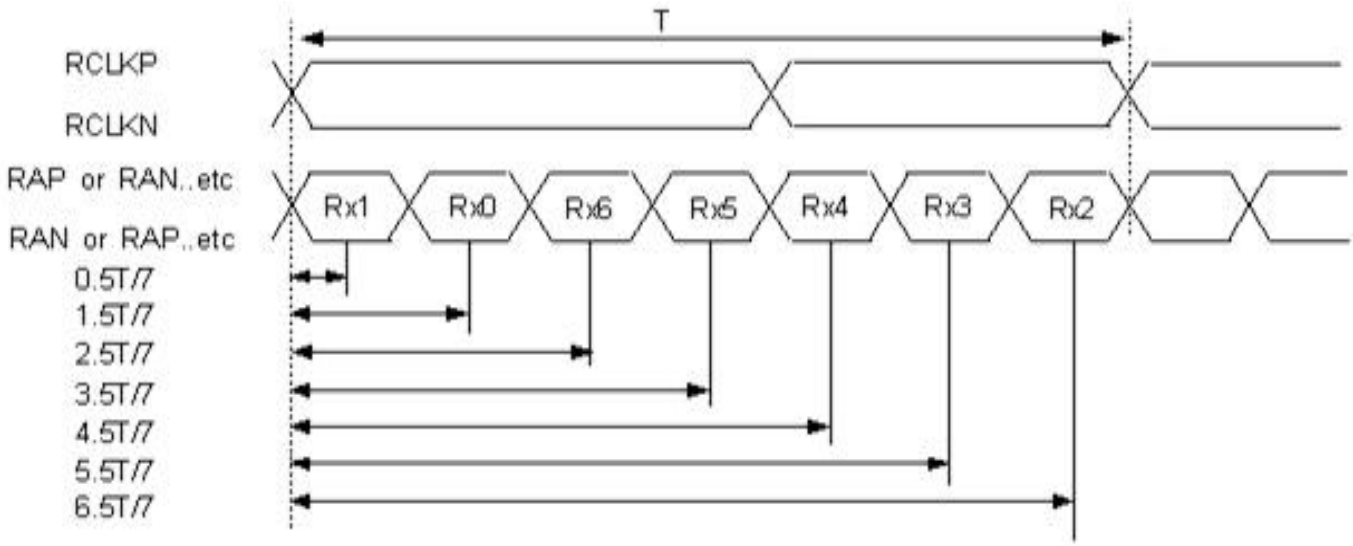
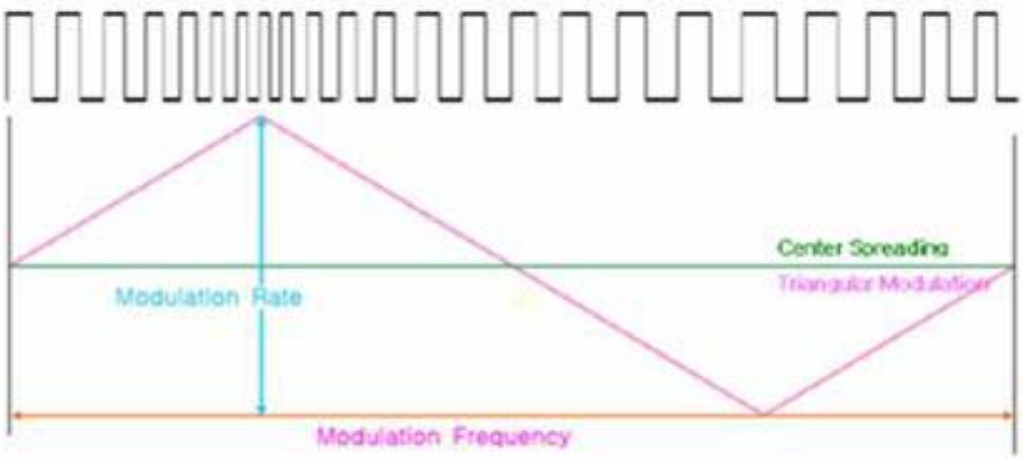
Note (2) : Ideal Strove Positions for LVDS Input



Note (3) : SSC (Spread Spectrum Clock)



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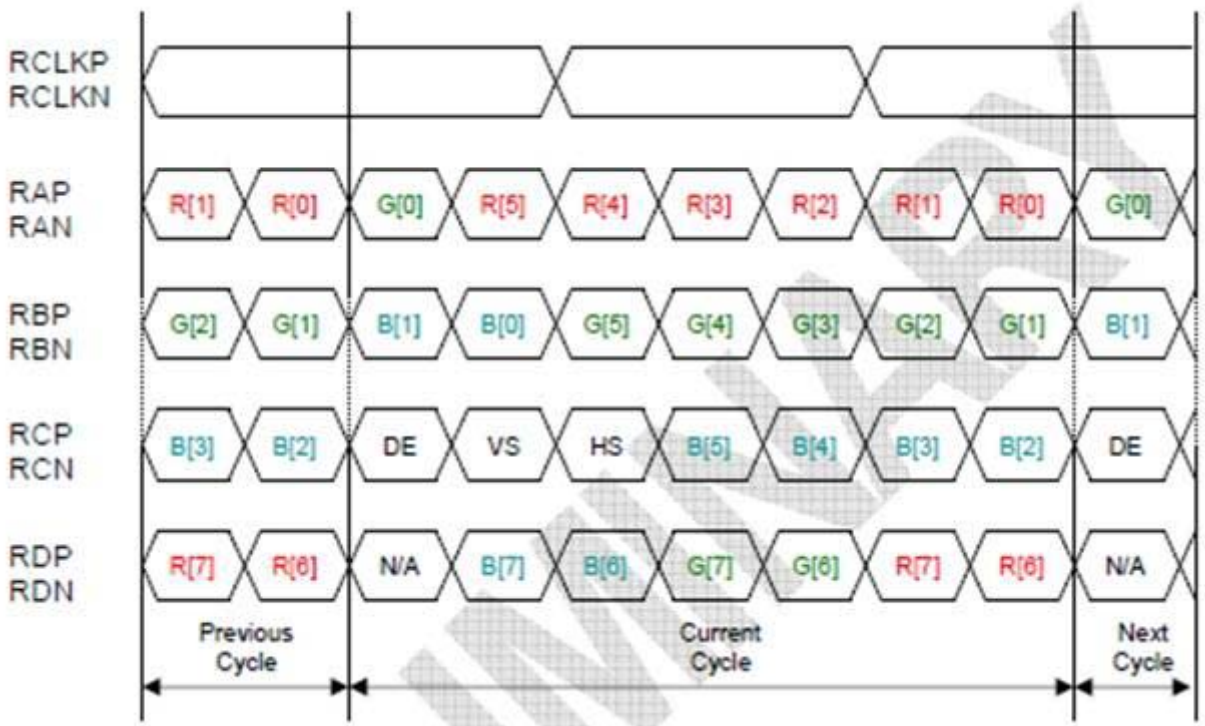
5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON (8bit, NS Format)



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5.4 Input Signals, Basic Display Colors and Gray Scale of Each Color

color & gray Scale	Data Signal																							
	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Light Blue	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Purple	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↕																								
	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	1	1	1	1		1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↕																								
	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0	1	1	1	1		1	1	1	0	0	0	0	0	0	0	0
Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
↕																								
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1		1	1	1

Note 1) Definition of gray :
Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)
Note 2)Input signal: 0 =Low level voltage, 1=High level voltage

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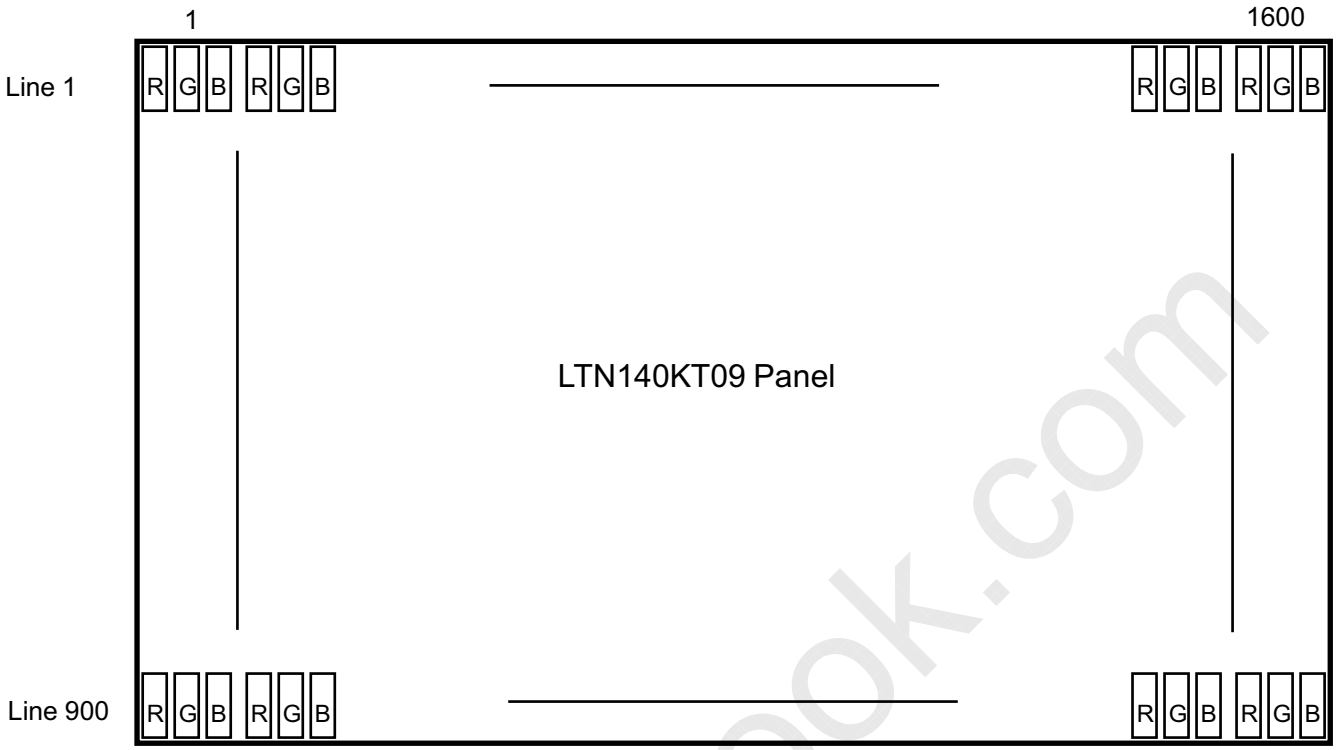
5.5 Pixel Format in the display



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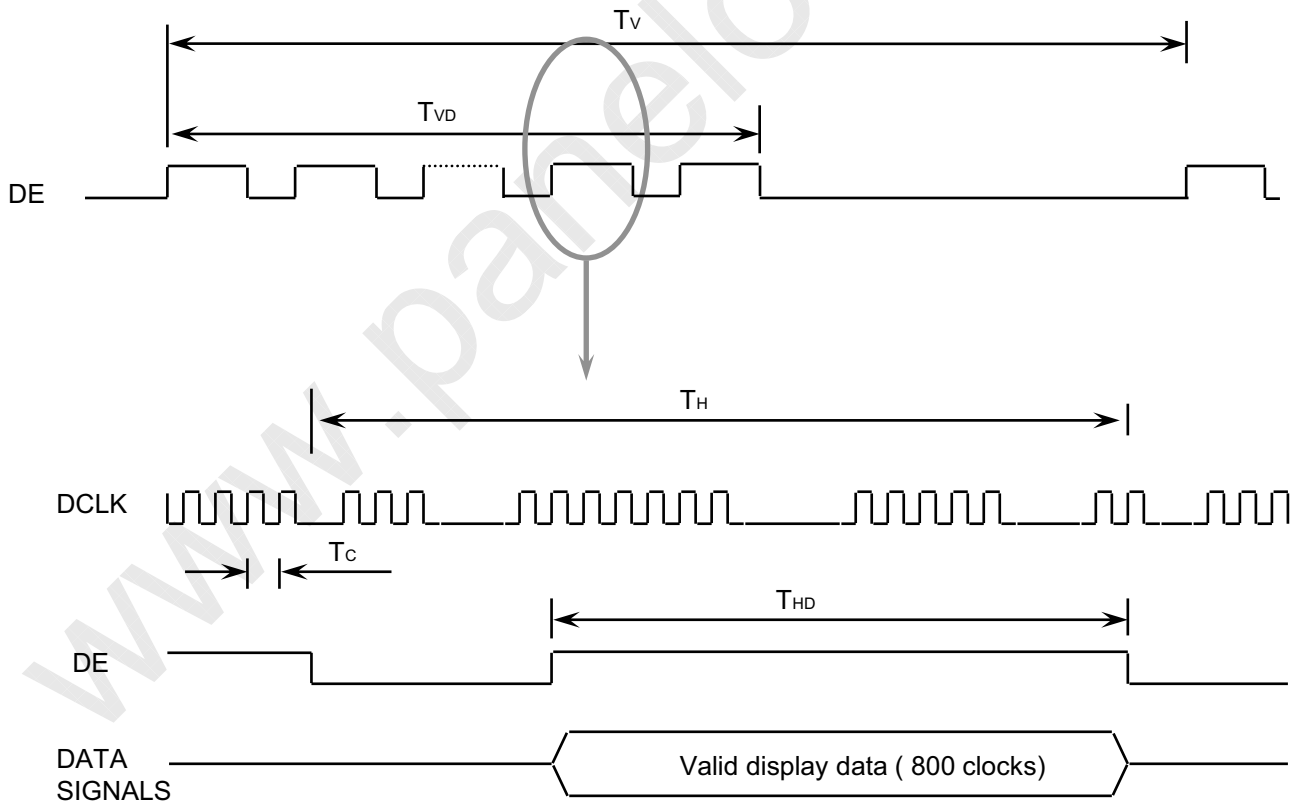
6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	900	930	1000	Lines	
Vertical Active Display Term	Display Period	TVD	-	900	-	Lines	
One Line Scanning Time	Cycle	TH	800	900	1069	Clocks	2ch
Horizontal Active Display Term	Display Period	THD	-	800	-	Clocks	2ch

6.2 Timing diagrams of interface signal



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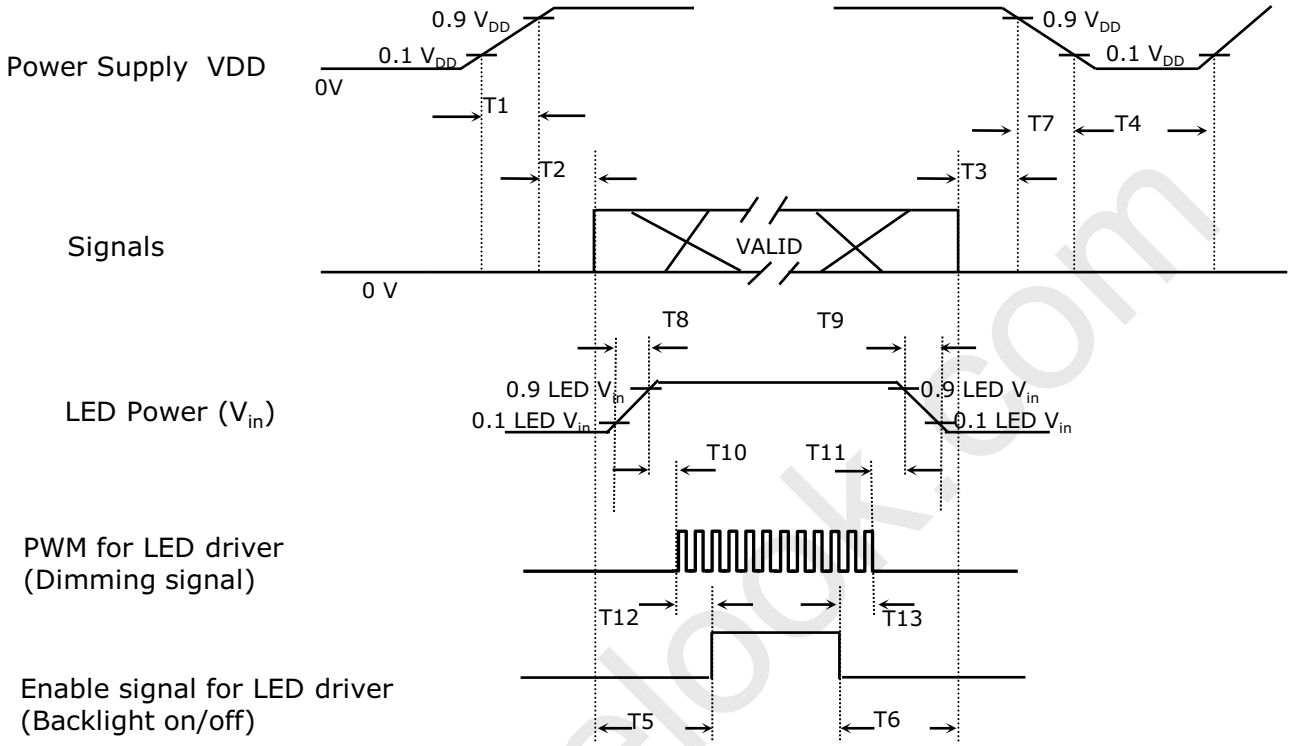
6.3 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

Timing (ms)	Remarks
0.5 < T1 ≤ 10	V_{DD} rising time from 10% to 90%
0 < T2 ≤ 50	Delay from V_{DD} to valid data at power ON
0 < T3 ≤ 50	Delay from valid data OFF to V_{DD} OFF at power Off
500 ≤ T4	V_{DD} OFF time for Windows restart
200 ≤ T5	Delay from valid data to B/L enable at power ON
200 ≤ T6	Delay from valid data off to B/L disable at power Off
0 < T7 ≤ 10	V_{DD} falling time from 90% to 10%
0.5 < T8 ≤ 10	LED V_{in} rising time from 10% to 90%
0.5 < T9 ≤ 10	LED V_{in} falling time from 90% to 10%
0 ≤ T10	Delay from LED driver Vin rising time 90% to PWM ON
0 ≤ T11	Delay from PWM Off to LED driver Vin falling time 10%, Must Keep rule
0 ≤ T12	Delay from PWM ON to B/L Enable ON, Must Keep rule
0 ≤ T13	Delay from B/L Enable Off to PWM Off

Power Sequence & Timing Parameters

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7. Mechanical Outline Dimension

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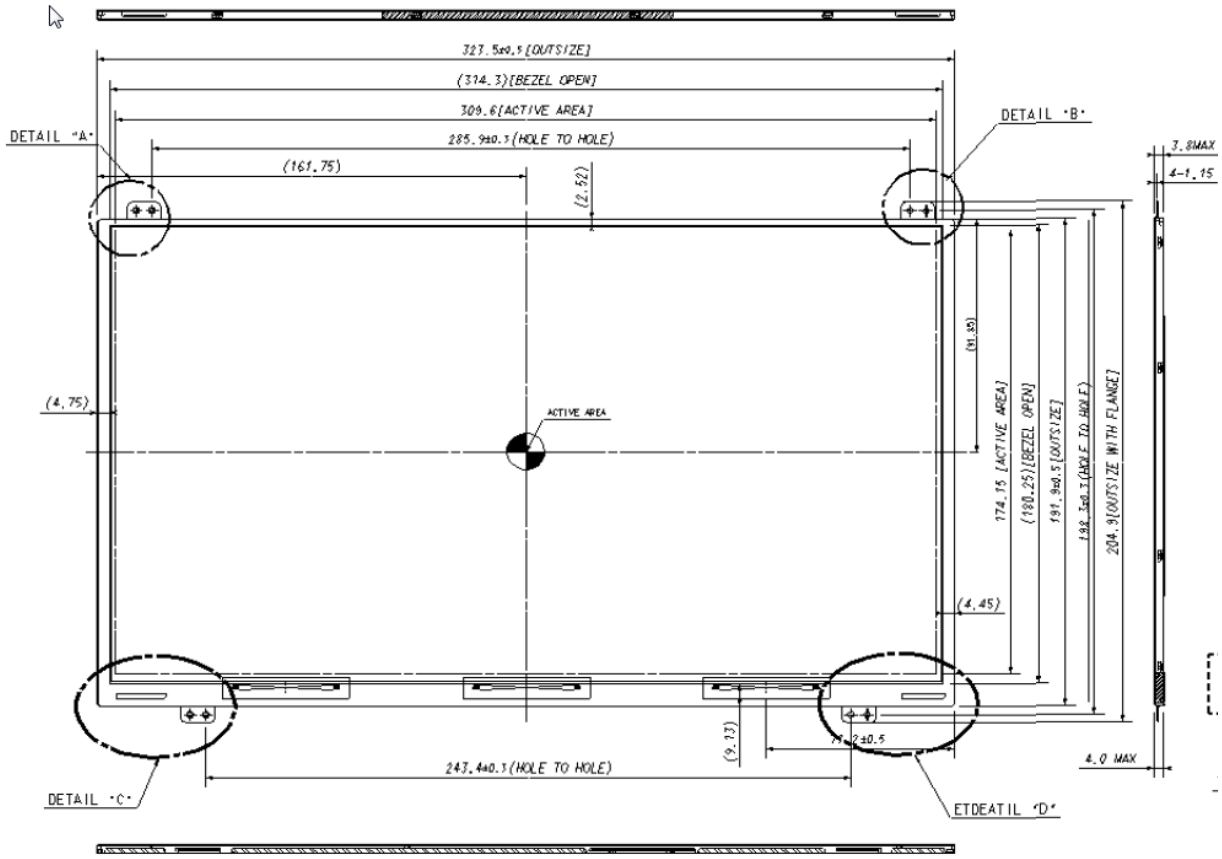

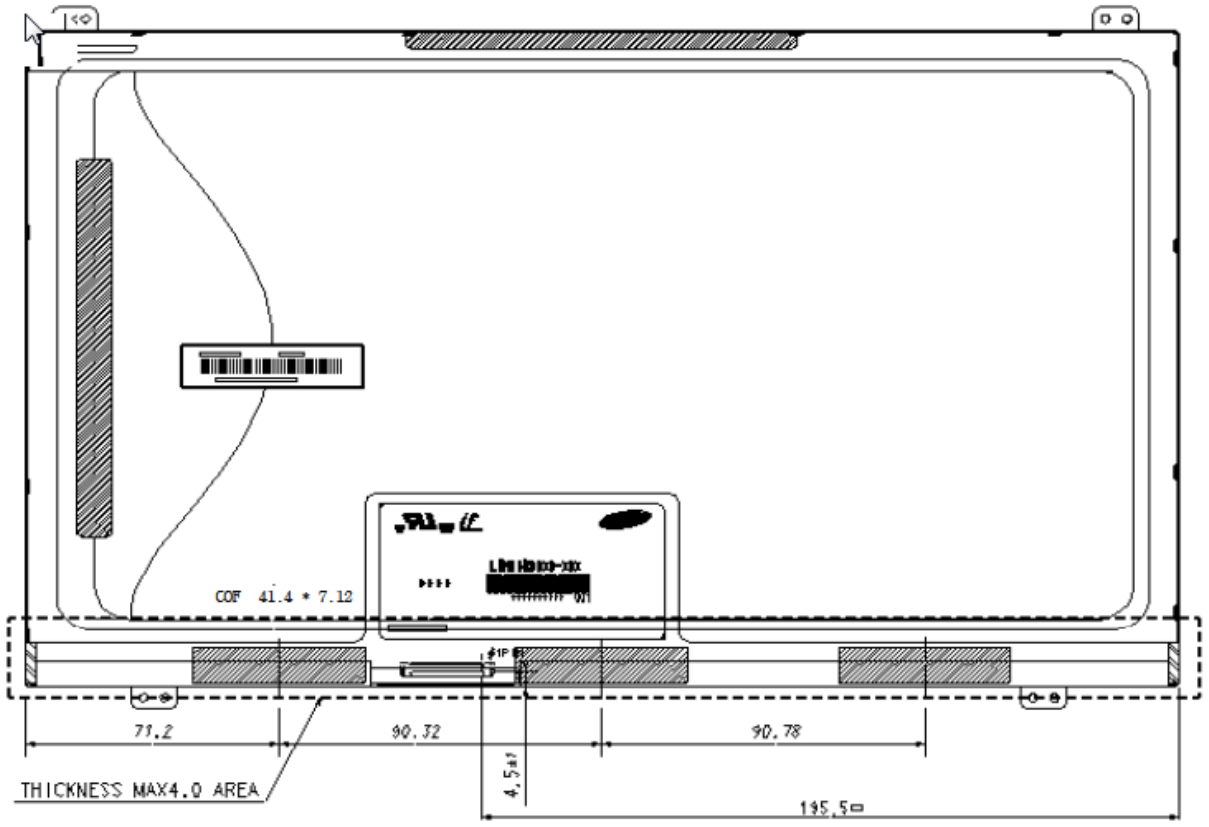

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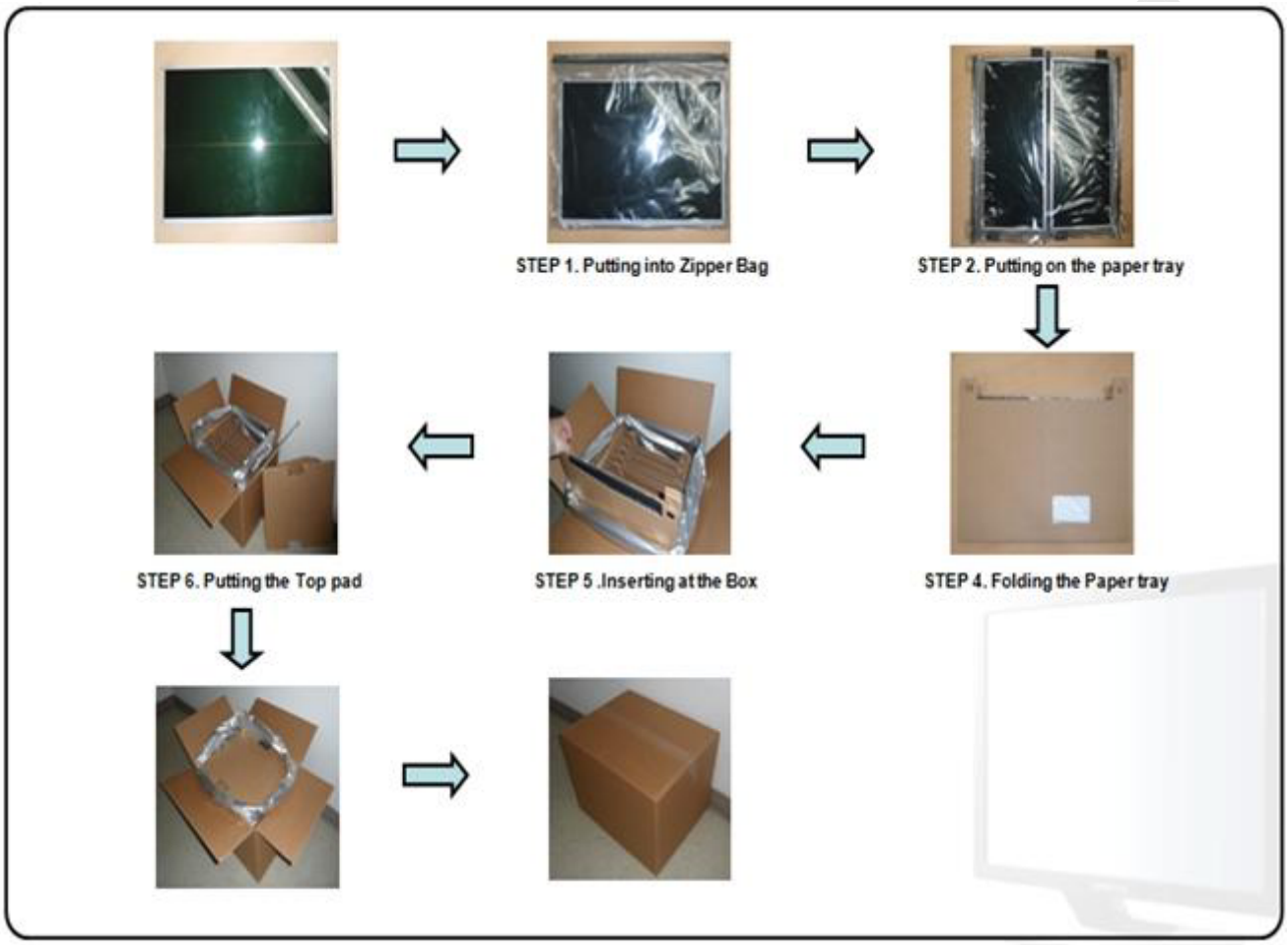
8. PACKING

1. CARTON(Internal Package)

(1) Packing Form
Corrugated Cardboard box and Corrupad form as shock absorber

(2) Packing Method



Note 1) Total Weight : Approximately 15kg
2) Acceptance number of piling : 36 sets
3) Carton size : 373(W) * 406(L) * 307(H)

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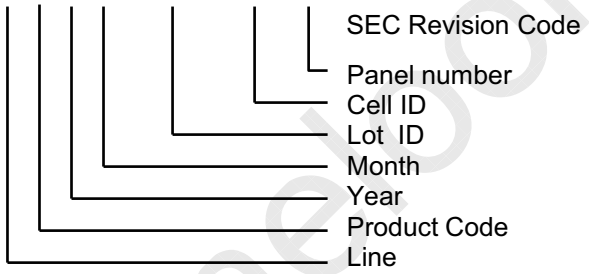
(3)Packing Material

No	Part name	Quantity
1	Static electric protective sack	36
2	Cushion pad(Inner box) included shock absorber	1 set
3	Silicagel (500x1)	1
4	Pictorial marking	2 pcs
5	Carton	1 set

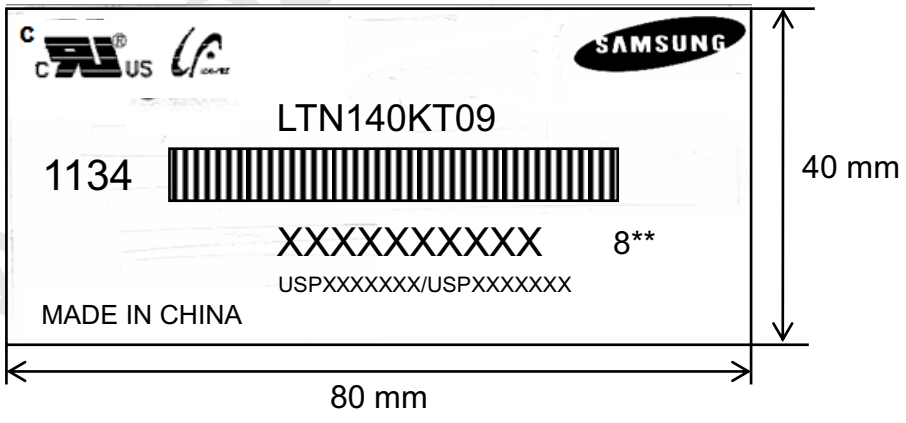
9. MARKINGS & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1)Parts number : LTN140KT09
(2)Revision code : 3 letters
(3)Lot number : X X X X XXX XX X **8****



(4) Nameplate Indication



Parts name : LTN140KT09
Lot number : XXXXXXXXXX
USPXXXXXXX/USPXXXXXXX : USP Related information Num.
Inspected work week : 1134(2011 year, 34th week)
Product revision Code : 8**

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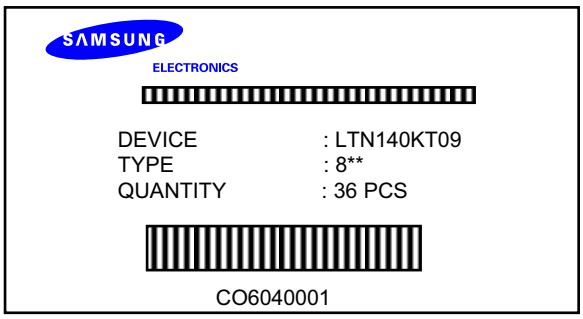
(5) Packing small box attach



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10. GENERAL PRECAUTIONS

1. Handling

(a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and LED back-light.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.

(i) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Do not pull or fold the lamp wire.

(l) Do not adjust the variable resistor which is located on the back side.

(m) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(n) Pins of I/F connector shall not be touched directly with bare hands.

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2. STORAGE

We highly recommend to comply with the criteria in the table below.

ITEM	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage life	12 months		
Storage Condition	- The storage room should provide good ventilation and temperature control. - Products should not be placed on the floor, but on the Pallet away from a wall. - Prevent products from direct sunlight, moisture nor water; Be cautious of a build up of condensation. - Avoid other hazardous environment while storing goods. - If products delivered or kept in conditions of over the storage period of 3 months, the recommended temperature or humidity range, we recommend you leave them at a temperature of 20℃ and a humidity of 50% for 24 hours.		

3. OPERATION

(a) Do not connect,disconnect the module in the " Power On" condition.

(b) Power supply should always be turned on/off by following item 6.3 " Power on/off sequence ".

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

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4. OTHERS

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on) Otherwise the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time,it can be the situation when the image “sticks” to the screen.

(e) This module has its circuitry PCB’s on the rear side and should be handled carefully in order not to be stressed.

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Appendix A. EDID

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Address (HEX)	FUNCTION	Value HEX	BIN	DEC	ASCII or Data	Notes
00	Header	00	00000000	0		EDID Header
01		FF	11111111	255		
02		FF	11111111	255		
03		FF	11111111	255		
04		FF	11111111	255		
05		FF	11111111	255		
06		FF	11111111	255		
07		00	00000000	0		
08	ID Manufacturer Name	4C	01001100	76	S	3 character ID
					E	
09		A3	10100011	163	C	"SEC"
0A	ID Product Code	48	01001000	72	[H]	
0B		31	00110001	49	[1]	
0C	32-bit serial no.	00	00000000	0		
0D		00	00000000	0		
0E		00	00000000	0		
0F		00	00000000	0		
10	Week of manufacture	00	00000000	0		
11	Year of manufacture	15	00010101	21	2011	2011
12	EDID Structure Ver.	01	00000001	1	1	EDID Ver. 1.0
13	EDID revision #	03	00000011	3	3	EDID Rev. 3
14	Video input definition	80	10000000	128		
15	Max H image size	1F	00011111	31	31	31 cm(approx)
16	Max V image size	11	00010001	17	17	17 cm(approx)
17	Display Gamma	78	01111000	120	2.2	Gamma 2.2
18	Feature support	0A	00001010	10		
19	Red/green low bits	09	00001001	9		10000111
1A	Blue/white low bits	E5	11100101	229		11111110
1B	Red x/ high bits	97	10010111	151	0.590	Red x 0.624= 1001010010
1C	Red y	57	01010111	7	0.340	Red y 0.340= 0101011100
1D	Green x	54	01010100	84	0.330	Green x 0.327= 0100111101
1E	Green y	8A	10001010	138	0.540	Green y 0.578= 1000110011
1F	Blue x	27	00100111	39	0.155	Blue x 0.154= 001001111
20	Blue y	22	00100010	34	0.135	Blue y 0.060= 001001111
21	White x	50	01010000	80	0.313	White x 0.313= 0101000001
22	White y	54	01010100	84	0.329	White y 0.329= 0101010001
23	Established timing 1	00	00000000	0		
24	Established timing 2	00	00000000	0		
25	Established timing 3	00	00000000	0		
26	Standard timing #1	01	00000001	1		not used
27		01	00000001	1		
28	Standard timing #2	01	00000001	1		not used
29		01	00000001	1		
2A	Standard timing #3	01	00000001	1		not used
2B		01	00000001	1		
2C	Standard timing #4	01	00000001	1		not used
2D		01	00000001	1		
2E	Standard timing #5	01	00000001	1		not used
2F		01	00000001	1		
30	Standard timing #6	01	00000001	1		not used
31		01	00000001	1		
32	Standard timing #7	01	00000001	1		not used
33		01	00000001	1		
34	Standard timing #8	01	00000001	1		not used
35		01	00000001	1		

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Appendix A. EDID

36		38	00111000	56	100.4	Main clock= 100.4 MHz
37		27	00100111	39		
38		40	01000000	64	1600	Hor active=1600 pixels
39		C0	11000000	192	192	Hor blanking=192 pixels
3A		60	01100000	96		4bit : 4bit
3B		84	10000100	132	900	Vertcal active=900 lines
3C		20	00100000	32	32	Vertical blanking=30 lines
3D		30	00110000	48		4bit : 4bit
3E		30	00110000	48	48	Hor sync. Offset
3F	Detailed timing/monitor descriptor #1	20	00100000	32	32	H sync. Width=32 pixels
40		25	00100101	37	2 5	V sync. Offset=2 lines V sync. Width=5 lines
41		00	00000000	0		2bit : 2bit :2bit :2bit
42		35	00110101	53	309	H image size= 309 mm(approx)
43		AE	10101110	174	174	V image size = 173 mm(approx)
44		10	00010000	16		
45		00	00000000	0		No Horizontal Border
46		00	00000000	0		No Vertical Border
47		19	00011001	25		
48		00	00000000	0		
49		00	00000000	0		
4A		00	00000000	0		Manufacturer Specified (Timing)
4B		0F	00001111	15		
4C		00	00000000	0		
4D		00	00000000	0		**Value**=HSPWmin / 2
4E		00	00000000	0		**Value**=HSPWmax / 2
4F	Detailed timing/monitor descriptor #2	00	00000000	0		**Value**=Thbpmin /2
50		00	00000000	0		**Value**=Thbpmax /2
51		00	00000000	0		**Value**=VSPWmin /2
52		00	00000000	0		**Value**=VSPWmax /2
53		00	00000000	0		**Value**=Tvbpmin / 2
54		00	00000000	0		**Value**=Tvbpmax / 2
55		28	00101000	40		Thpmin=**value***2 + HA pixelclks
56		80	10000000	128		Thpmax=**value***2 + HA pixelclks
57		0A	00001010	10		Tvpmin=**value***2 + VA lines
58		1E	00011110	30		Tvpmax=**value***2 + VA lines
59		00	00000000	0		Module revision
5A		00	00000000	0		
5B		00	00000000	0		
5C		00	00000000	0		ASCII Data String Tag
5D		FE	11111110	254		
5E		00	00000000	0		
5F		53	01010011	83	[S]	
60		41	01000001	65	[A]	
61	Detailed timing/monitor descriptor #3	4D	01001101	77	[M]	
62		53	01010011	83	[S]	
63		55	01010101	85	[U]	
64		4E	01001110	78	[N]	
65		47	01000111	71	[G]	
66		0A	00001010	10	[*]	
67		20	00100000	32	[ ]	
68		20	00100000	32	[ ]	
69		20	00100000	32	[ ]	
6A		20	00100000	32	[ ]	
6B		20	00100000	32	[ ]	
6C		00	00000000	0		
6D		00	00000000	0		
6E		00	00000000	0		Monitor Name Tag (ASCII)
6F		FE	11111110	254		
70		00	00000000	0		
71		4C	01001100	76	[L]	
72		54	01010100	84	[T]	
73	Detailed timing/monitor descriptor #4	4E	01001110	78	[N]	
74		31	00110001	49	[1]	
75		34	00110100	52	[4]	
76		30	00110000	48	[0]	
77		4B	01001011	75	[K]	
78		54	01010100	84	[T]	
79		30	00110000	48	[0]	
7A		39	00111001	57	[9]	
7B		38	00111000	56	[8]	
7C		0A	00001010	10	[*]	
7D		20	00100000	32	[*]	
7E	Extension Flag	00	00000000	0		
7F	Checksum	F8	11111000	248		

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Appendix B. MTBF Data

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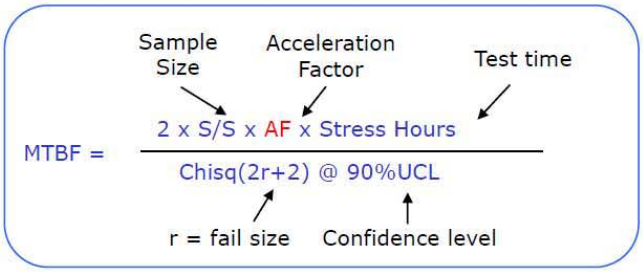
MTBF

* MTBF for Panel



※ Arrhenius Model : HTOL(55℃) AF=12.1

- Arrhenius equation

AF = EXP (Ea/k * (1/Tu - 1/Ts))

Tu : User Temp. Ts : Stress Temp.

Ea : Activation Energy

k : Boltzmann constant (= 8.617×10^{-5} eV)

※ HTOL data base.

※ Ea : Activation Energy (=0.7eV)

※ Confidence level : 60%

MTBF (Mean Time Between Failure) = 1/FR

[MTBF Simulation Result.]

Test item	Stress Temp.	Test Time	User Temp	AF	S/S	MTBF	remark
HTOL	55 ℃	500hr	25 ℃	12.1	12	31,532 hrs	-
Result	-	-	-	-	-	31,532 hrs	-

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Appendix C. Safety Approval

Approval

the standard in safety

Underwriters Laboratories

NOTICE OF AUTHORIZATION TO APPLY THE UL MARK

08/18/2011

Samsung Electronics Co Ltd
Mr. Kyoungjae Lee
200 Myeongam-ri
Tangjeong-myeon
Asan- Shi Chungcheongnam-do 336-841, Kr

Our Reference:	File E164704, Vol. X1	Project Number	11CA41546
Your Reference:	LEE, KYOUNGJAE MR.		
Project Scope:	USR/CNR - 14 Inch TFT LCD, Model LTN14#&***, Alternate converter typed, LTN140KT09KPLV0.1_HF REV0.0 by SMAUSNG ELECTRONICS for E164704, X1, A126.		

Dear Mr. Kyoungjae Lee:

UL's investigation of your product(s) has been completed under the above Reference Number and the product was determined to comply with the applicable requirements.

This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Mark only at authorized factories under UL's Follow-Up Service Program.

To provide the manufacturer with the intended authorization to use the UL Mark, the addressee must send a copy of this notice to each manufacturing location currently authorized in File E164704, Vol. X1.

This authorization is effective from the date of this Notice and only for products at the indicated manufacturing locations. Records in the Follow-Up Services Procedure covering the product are now being prepared and will be sent in the near future. Until then, this letter authorizes application of the UL Mark for 90 days from the date of this letter.

Products that bear the UL Mark shall be identical to those that were evaluated by UL and found to comply with UL's requirements. If changes in construction are discovered, appropriate action will be taken for products not in conformance with UL's requirements and continued use of the UL Mark may be withdrawn. UL may elect to withdraw use of the UL Mark if the Applicant or Manufacturer fails to comply with UL's requirements including ongoing compliance of the product, under UL's Follow-Up Service.

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Appendix C. Safety Approval

Notice of Authorization - 11CA41546

Any information and documentation provided to you involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

The contents of this Letter are intended solely for the use of UL and the Applicant. The opinions and findings of UL represent its judgment given with due consideration to the necessary limitations of practical operation in accordance with UL's objectives and purposes. UL shall not otherwise be responsible for the use of or reliance upon the contents of this letter by anyone. UL shall not incur any obligation or liability for any loss, expense or damages, including incidental, consequential or punitive damages, arising out of or in connection with the use or reliance upon the contents of this letter to anyone other than the Applicant as provided in the agreement between UL and Applicant. Any use or reference to UL's name or certification mark(s) by anyone other than the Applicant in accordance with the agreement is prohibited without the express written approval of UL.

Very truly yours,

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CC: CTK CO LTD, MR. JUNGHYUN SON

SEOCAAE-4D3B8D

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Appendix D. Pogo Test Result

Approval

- Model : LTN140KT09-801
- Test Condition

Class	Pressure	Plate Diameter	Total cycle	Seed	Position
LCD Panel only	7~20kgf	10mm	10cyc/point	Hold 2s / open 1s	Total 9 point

- Criterion : LCD Panel Only , Black gap (1 degree) same or under @10Kgf
- Test Result : PASS

Class		7Kgf	8Kgf	9Kgf	10Kgf	11Kgf	12Kgf	14Kgf	16Kgf	18Kgf
PANEL 1	0hr	1	1	1	1	1	1	1	1	1
	2hr	1	1	1	1	1	1	1	1	1
PANEL 2	0hr	1	1	1	1	1	1	1	1	2
	2hr	1	1	1	1	1	1	1	1	2
PANEL 3	0hr	1	1	1	1	1	1	1	1	1
	2hr	1	1	1	1	1	1	1	1	1

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Appendix E. Key Part List

Approval

				CS 1 sample
일반 사양			MOD Line	DID
			OLB Site	Tangjung
			Resolution	1600*900
			Color Depth	45%
			Brightness	300nit
			Contrast Ratio	300 : 1 Typ.
			Viewing Angle	45/45/15/30 typ
			Weight(typ)	355g Max
			Outline	323.5 x 191.9
			Thickness	4.0 max
Cell	Glass		Technology	MB6/ ASG2
			FAB	L6
			Mask Number	4 MASK
			Thickness (㎜)	0.5
	Polarizer	Front	Maker	KORENO
			Type/Model	NPF-TEGQ1466DUAG470
		Surface Treatment	Coating	AG
			Wide View Film	-
		Rear	Maker	Cheil
			Type/Model	AMN-0246 AG25
	LC		Maker	Merck
			Type/Model	MAT-09-2122-70
			액정/Pixel 구조	ATN7/T3++
			Response time (ms)	16
			Voltage(V)	3.0V
	Drive method of inversion			Column
Elec	T-con		Maker	Magna
			Type/Model	FBGA / LPM70G4(Alice)
			Voltage(V)	2.5V
			T-con => Source Driver IC	LVDS
	Source	PCB	Maker	SGCE/Tripod
			Material	FR4
			Layer	10
			PCB Rev. code	V0.4
		Driver	Maker	DB
			Type/Model	DB7691A-FT10MB
			Number of output pin	960
			Input Voltage (V)	2.5
	Gate	Driver	Maker	-
			Type/Model	-
			Number of output pin	-
			Input Voltage (V)	-
	LED controller		Maker	-
			Type/Model	-
Back Light	LED		Maker	Samsung LED
			Quantity.	36ea
			Qty (strings x LEDs)	6X6
			LED current (mA)	27mA
			LED 광도(Typ)	2.5cd
			LED assembly maker	Samsung LED
	FPC		Maker	-
	Diffuser	Upper	Maker/Type	-
		Lower	Maker/Type	SKC/CH272NH
	Prism sheet	Upper	Maker/Type	CHEIL/MAS427ASF-1
		Lower	Maker/Type	U-BRIGHT/H505A
	Light Guide Plate		Maker/Type	PMMA, T0.8
			Pattern	Printed
	Reflector Sheet		Maker/Type	SY70
	Backlight Assembly Maker			Donghwa

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Appendix F. Impedance Test Result

Approval

LTN140KT09 Impedance 측정 결과

We are ONE!

◆ 측정 일시 : 2011년 9월 6일
◆ 대상 모델 : IT事 LTN140KT09-8 SMS
◆ 측정 결과 : Pass

구분	#INTRA
파형	
Average Level	83.91ohm
Spec	100ohm±20%

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